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(54) Colour display tube having a deflection device and deflection device for a colour display tube.

(57) In a television deflection device which is mounted on a colour cathode ray tube a frusto-conical supporting member (3) has a pair of coil halves (6) and (7) which form horizontal deflection coils. These coils have longitudinal portions (11, 12, 14) and (15) which extend to the front and the rear of the supporting member (3), an elongate tapered spacer (17) and (18) being inserted in the spacers between adjacent longitudinal portions of these coils. Movements of the spacers (17) and (18) adjusts the space between the longitudinal portions and which provides mechanical means for correcting for asymmetries in the display device.

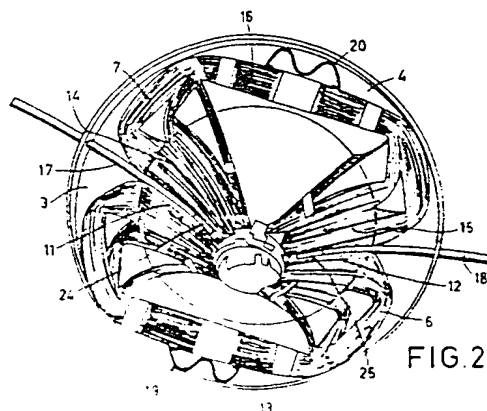


FIG. 2

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"Colour display tube having a deflection device and deflection device for a colour display tube".

5 The invention relates to a colour display tube having three electron guns positioned in one plane for projecting three electron beams towards a display screen, and having a deflection device which is mounted on the display tube, said deflection device having a substantially frusto-conical supporting member with a front end facing said display screen having a large diameter and a rear end facing said electron guns having a relatively small diameter, which member supports a first set of deflection coils arranged about the longitudinal axis of said tube for deflecting the three electron beams in a first direction, and a second set of deflection coils arranged about said axis for deflecting the three electron beams in a second direction orthogonal to said first direction, 10 the first set comprising two coils one of which is provided opposite to and spaced from the other in the supporting member with each coil being formed by two longitudinal parts extending substantially parallel to the said axis and being connected at their respection front and rear ends by transverse parts. 15 20

Due to mechanical spreads in the production and/or assembly of deflection coils with two longitudinal parts which are connected by transverse parts (so-called saddle-type coils) for deflection devices in colour television sets, asymmetries can hardly be avoided. 25

Asymmetries in the coil halves cause certain picture defects. It is known from Netherlands Patent Specification No. 148,881 that such defects can be corrected by providing four auxiliary coils with the current through the turns of said auxiliary coils being in such a direction and of a value that a correction quadrupole field which can be reversed in polarity is generated which is substantially proportional to the deflection current 30

through one deflection coil and/or to the deflection current through the other deflection coil.

This known (electromagnetic) correction device which requires winding four extra coils and a circuit arrangement for energizing said coils, is complicated and hence expensive.

It is the object of the invention to provide a mechanical correction means instead of an electromagnetic correction means which is relatively simple and possible, less expensive.

In order to reach the end in view, the colour display tube having a deflection device of the kind mentioned in the opening paragraph is characterized according to the invention in that adjusting means cooperating with the longitudinal parts of the coils of the first set are provided so as to vary for the correction of asymmetry defects of the first set of deflection coils, the distances between the adjoining longitudinal parts at least at one end of the supporting member. If needed pressure means for pressing the said longitudinal parts against the adjusting means may be provided.

When using adjusting means to adjust the distance between the adjoining longitudinal parts of two coils of the first set selectively, the effect of the adjustment on asymmetry and/or astigmatic defects can be observed on the screen of a measuring tube on which the deflection device is placed during the manufacture.

For optimum adjustment it is of importance for the two coils of the first set of deflection coils to be symmetrical relative to the plane in which the three electron guns are positioned.

A first preferred embodiment of the colour display tube having a deflection device according to the invention is characterized in that the adjusting means comprises two wedge-shaped spacers each of which is movable in the longitudinal direction of the respective spaces formed between the said adjoining longitudinal parts.

A second preferred embodiment of the colour display tube having a deflection device according to the invention is characterized in that the adjusting means comprise two eccentrics which are rotatable about axes and which are respectively positioned in the spaces formed between the said adjoining longitudinal parts.

A third preferred embodiment of the colour display tube having a deflection device according to the invention is characterized in that the adjusting means comprises four cams which are movable in the front of the supporting member and which each cooperate with an internal surface of one of the corners formed between a longitudinal part and a front transverse part, in which for increasing the distance between a first set of two oppositely located longitudinal parts and simultaneously reducing the distance between the other said of oppositely located longitudinal parts the cams cooperating with the first set can be moved apart, and conversely.

When using movable wedges which engage the coils, it will in most of the cases be practical to place the coils under a certain spring pressure in order that they follow a displacement of the wedges optimally. If on the contrary the support member is provided with movable cams, said cams may be positioned so that they themselves take along the coils during their displacement.

An alternative construction in which no spring means are necessary is formed by a supporting member consisting of two or more parts, the parts being movable relative to each other and taking along the coils during their movements. The supporting member may be divided into two parts, for example, on the front said and in the conical portion along a plane in which the three electron guns are positioned. By means of two eccentrics the two parts can be moved towards each other or pressed apart in order to adjust the distance between the axial parts of the (line) coils rigidly fixed on the parts of the supporting member. An extra advantage is that upon adjusting the

coils their fixed position on the supporting member is maintained, which is not the case in the above-mentioned constructions. As a result of this the stability of the coils is better ensured.

5 A modified embodiment of this latter concept is formed by a supporting member in which each axial coil part is secured to a partially cut-out part of the supporting member. By means of an eccentric journaled on the fixed portion of the supporting member, a pair of two
10 oppositely located cut-out parts which are provided with projection cooperating with the eccentric may be forced towards each other or away from each other while taking along the coils secured to said cut-out parts. As the above-described means, these adjusting means may be pro-
15 vided on the front side and/or on the rear side of the deflection device.

The invention which also relates to a deflection yoke for a colour display tube will now be described in greater detail, by way of example, with reference to
20 the drawing.

Figure 1 is a diagrammatic cross-sectional view (taken along the Y-Z plane) of a deflection device mounted on a colour television display tube.

Figure 2 shows on a slightly enlarged scale a
25 perspective view of the deflection device of Figure 1 and shows in particular one adjusting means for varying the distance between the line coil halves.

Figure 3 shows diagrammatically the same elevation as Figure 2 with a modified embodiment of an
30 adjusting means used in the invention.

Figure 4 is a perspective view of a further modified embodiment of an adjusting means which may be used in the invention.

Figure 5 shows diagrammatically an elevation of
35 a deflection device which can be compared to the elevation of Figure 2, but having alternative adjusting means.

Figure 6 shows parts of two oppositely located

line coil halves and an eccentric with which their distance can be varied.

Figure 7 is a partial front elevation of an alternative embodiment of a supporting member for a deflection unit in accordance with the invention.

An in-line colour television display tube 1 is a display tube of the type in which an electron gun configuration 42 for producing three electron beams situated in one plane is placed in the rear neck portion 41 and in which recurrent groups of blue, red and green phosphor dots are provided on the screen part 43 before a shadow mask 44. Between the rear neck portion 41 and the screen part 43 an envelope 45 varying from narrow to wide is present.

Referring now to Figure 1, a deflection device 2 for such a display tube 1 comprises a spread or support 3 of insulating material having a front upright end 4 and possibly a rear upright end 5. Between said ends 4 and 5 two line deflection coils halves 6 and 7 are present on the inside of the support 3 and a ring core of magnetizable material is present on the outside of the support 3 on which core a field deflection coil consisting of two oppositely located halves 9 and 10 is wound toroidally. The field deflection coil halves may alternatively be of the - self-supporting- saddle type.

The two halves 6 and 7 of the line deflection coil are of the saddle-type having two upright ends. However, they may also be of the type having only a front upright end and a rear end which is formed to conform closely to the surface of the display tube so that the upright rear end 5 of the support 3 may be omitted and it becomes possible to use an undivided ring core 8.

In Figures 2, 3 and 4 the same reference numerals as in Figure 1 are used for the same components. It will be obvious from Figure 2 that two (line) deflection coils halves 6 and 7 are present on the inside of the support 3. The coil half 6 has two longitudinal parts 11

and 12 which are connected at the front by a transverse part 13. The coil half 7 has two longitudinal parts 14 and 15 which at the front are connected by a transverse part 16. A separate spacer 17 is present between the adjoining longitudinal parts 11 and 14 and a similar
5 separate spacer 18 is provided between the adjoining longitudinal parts 12 and 15. The width of the spacers 17 and 18 which are preferably manufactured from a synthetic material tapered from the portion at the front of the support member towards the portion at the rear. The longi-
10 tudinal parts 11 and 12 (the "body") of coil half 6 are pressed against the spacers 17 and 18 by the force which a resilient element 19 exerts, while the longitudinal parts 14 and 15 (the "body") of coil half 7 is pressed
15 against the spacers 17 and 18 by the force which a resilient element 20 exerts, the resilient members being present between a lip on the support member 3 and the connected front transverse parts 16 and 13.

The "bodies" of the coil halves 6 and 7 do not
20 bear against the support member 3 so that their positions are exclusively determined by the enclosure of their front ends 13 and 16, respectively, between the resilient elements 19 and 20, respectively, and the spacers 17 and 18. Initially the spacers 17, 18 are forced towards the
25 rear of the support member as far as possible (space between the coil halves is maximum) and during adjustment these spacers are retracted independent of each other until the asymmetry defects occurred during the manufacture and/or assembly have been corrected. So during the adjustment
30 the width of the spaces between the coil halves becomes smaller. The spring pressure exerted on the front ends 13, 16 ensures that the "bodies" of the coil halves 6, 7 follow the retraction of the spacers 17, 18. It is of importance for the symmetrical location of the coil halves
35 to be maintained during the adjustment, in other words, the spacers must be guided symmetrically. An auxiliary means for this purpose is a slot or groove 21 provided in

the X-Z plane in the support 3 into which a ridge 22 formed on the space 17 fits as shown diagrammatically in Figure 3. Furthermore, the spacer can be safeguarded against tilting by providing their lower side with a pad 23 projecting on either side, as is shown in Figure 4, which lies below the "bodies" of the coil halves 6 and 7. The separate spacers 17, 18 need not continue into the rear end of the support 3. Fixed projections 24, 25 having a width not smaller than the smallest width, but not larger than the large width of the loose pegs 17 and 18 in Figure 2 are preferably located on the rear part of the support member 3.

The use of separate wedge-shaped spacers makes it possible to adjust the distances between the coil halves independently of each other, which provides the maximum number of correction possibilities. During the adjustment the coil halves are not moved parallel to each other. When it is preferred to move the coil halves parallel to each other indeed, an alternative solution is possible within the scope of the invention. A diagrammatic construction hereof is shown in Figure 5. This Figure is a front elevation of two line coil halves 26 and 27. At the regions where their longitudinal parts 28, 29 and 30, 31, respectively, are connected by transverse parts 32 and 33, respectively, rotatable cams 34, 35, 36, 37 are present. By moving the cams 35 and 37 apart, the distance between the parts 29 and 31 becomes larger and that between the parts 28 and 30 becomes smaller, the sum of the distances remaining constant. However, this way of adjustment does not permit adjusting the distances independently of each other and therefore does not present the maximum number of correction possibilities.

Another adjusting possibility is shown with reference to Figure 6. This possibility comprises the use of eccentrics which are rotatable about an axis Z (for example in the form of elliptical members, as the member 38) between two adjoining longitudinal parts 39 and 40.

Figure 7 is a front elevation of the left-hand part of a supporting member 41 suitable for supporting coils for a deflection unit in accordance with the invention. Slots 42, 43, 44, 45, 46 and 47 are provided in the supporting member so that partially cut-out parts 48 and 49 are formed. These parts 48 and 49 are provided with catches 50 and 51. An eccentric 52 is journalled in the fixed part of the supporting member 41 with which the catches 50, 51 can be moved towards each other or away from each other and as a result of which the distance between the coils 48, 49 can be varied.

A first coil of a set of line coils may be connected to the part 48, an axial part of the first coil engaging an edge 53. The second coil of the set of line coils may be secured to the part 49, an axial part of the second coil engaging an edge 54. The distance between the oppositely located axial parts of the first and second coils is adjustable by rotating eccentric 52.

For correcting line asymmetry and line astigmatism defects, only small coil displacements prove to be necessary. These vary from a few tenths of a millimetre to a millimetre.

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CLAIMS

1. A colour display tube having three electron guns which are positioned in one plane for projecting three electron beams towards a display screen, and having a deflection device which is mounted on the display tube, said deflection device having a substantially frust-conical supporting member with a front end facing said display screen having a large diameter and a rear end facing said electron guns having a relatively small diameter, which member supports a first set of deflection coils arranged about the longitudinal axis of said tube deflecting the three electron beams in a first direction, and a second set of deflection coils arranged about said axis for deflecting the three electron beams in a second direction orthogonal to said first direction, the first set comprising two coils one of which is provided opposite to and spaced from the other in the supporting member with each coil being formed by two longitudinal parts extending substantially parallel to the said axis and being connected at their respective front and rear ends by transverse parts, characterized in that adjusting means cooperating with the longitudinal parts of the coils of the first set are provided so as to vary the distances between the adjoining longitudinal parts at least at one end of the supporting member, and pressure means for keeping the said longitudinal parts in contact with the adjusting means.

2. A colour display tube as claimed in Claim 1, characterized in that the two coils of the first set of deflection coils are positioned symmetrically relative to the plane in which the three electron guns are positioned.

3. A colour display tube as claimed in Claim 1 or 2, characterized in that the front end of the supporting

member has a lip and the pressure means consists of two resilient elements placed diametrically opposite to each other between the lip and the front transverse parts of the coils.

5 4. A colour display tube as claimed in Claim 1, 2 or 3 characterized in that the adjusting means comprises two wedge-shaped spacers each of which is movable in the longitudinal direction of the respective spaces formed between the said adjoining longitudinal parts.

10 5. A colour display tube as claimed in Claim 4, characterized in that the dimension of each spacer is in the form of an elongate member which tapers from the front end to the rear end of the supporting member.

6. A colour display tube as claimed in Claim 4 or 5,
15 characterized in that the spacers can be operated from the front end of the supporting member.

7. A colour display tube as claimed in Claim 3, characterized in that near the rear side of the support member are located thereon between the two coils of said
20 first set of deflection coils fixed spacers having a width at least equal to the smallest width of the adjusting means but not larger than the greatest width of said adjusting means.

8. A colour display tube as claimed in Claim 1 or 2,
25 characterized in that the adjusting means comprises two eccentrics which are rotatable about axes and which are respectively positioned in the spaces formed between the said adjoining longitudinal parts.

9. A colour display tube as claimed in Claim 1,
30 characterized in that the adjusting means comprises four cams movable in the front of the supporting member and each cooperating with an internal surface of one of the corners formed between a longitudinal part and a front transverse part, in which, for increasing the distance be-
35 tween a first set of two oppositely located longitudinal parts and simultaneously decreasing the distance between the other set of oppositely located longitudinal parts,

the cams cooperating with the first set can be moved apart, and conversely.

10. A deflection device for a colour display tube having three electron guns positioned in one plane, said device comprising a substantially frusto-conical supporting member with a front end with a large diameter and a rear end with a relatively small diameter, which member supports a first set of deflection coils arranged about its longitudinal axis for generating a magnetic deflection field in a first direction and a second set of deflection coils arranged about said axis for generating a magnetic deflection field in a second direction orthogonal to said first direction, the first set comprising two coils one of which is provided opposite to and spaced from the other in the supporting member with each coil being formed by two longitudinal parts extending substantially parallel to the said axis and being connected at their respective front and rear ends by transverse parts, characterized in that adjusting means cooperating with the longitudinal parts of the coils of the first set are provided so as to vary the distances between the adjoining longitudinal parts at least at one end of the supporting member, and pressure means for keeping the said longitudinal parts in contact with the adjusting means.

11. A deflection yoke as claimed in Claim 10, characterized in that the two coils of the first set of deflection coils are symmetrical relative to the plane in which the three electron guns are positioned.

12. A deflection yoke as claimed in Claim 10 or 11, characterized in that the front end of the supporting member has a lip and that the pressure means consists of two resilient elements placed diametrically opposite to each other between the lip and the front transverse parts of the coils.

13. A deflection yoke as claimed in Claim 10, 11 or 12, characterized in that the adjusting means comprises two wedge-shaped spacers each of which is movable in the

longitudinal direction of the respective slots formed between the said adjoining longitudinal parts.

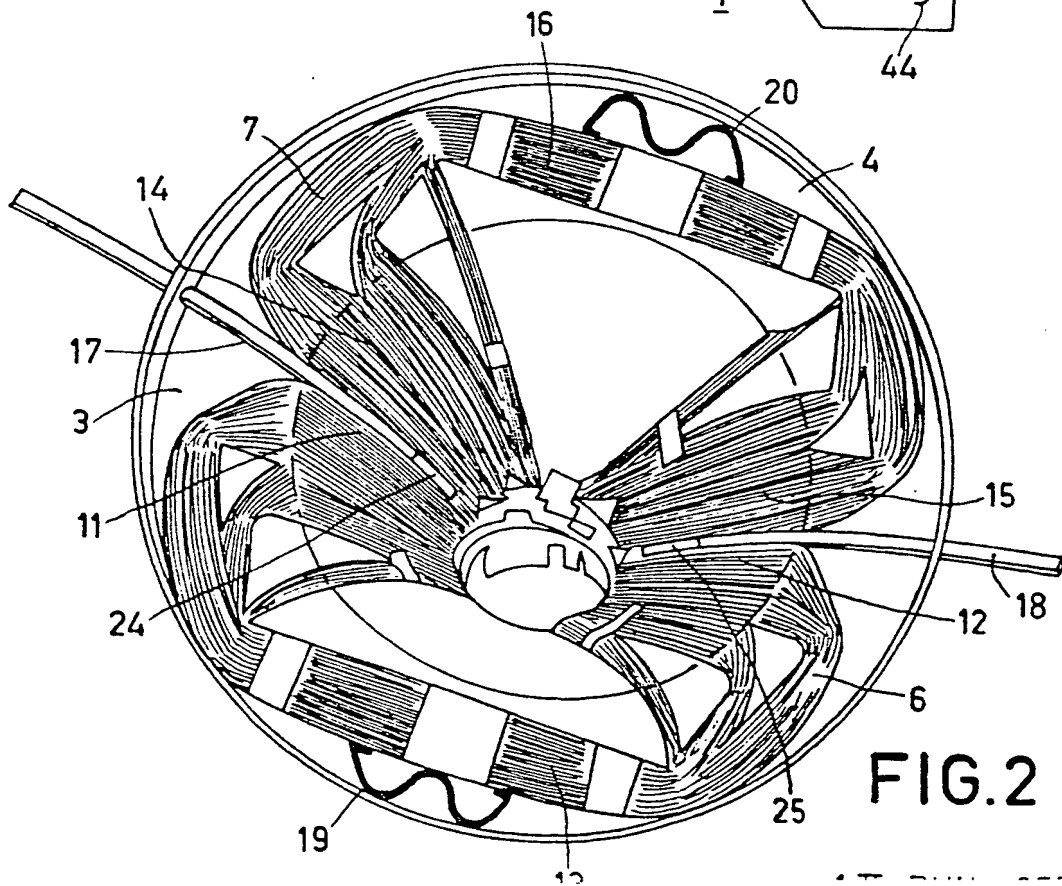
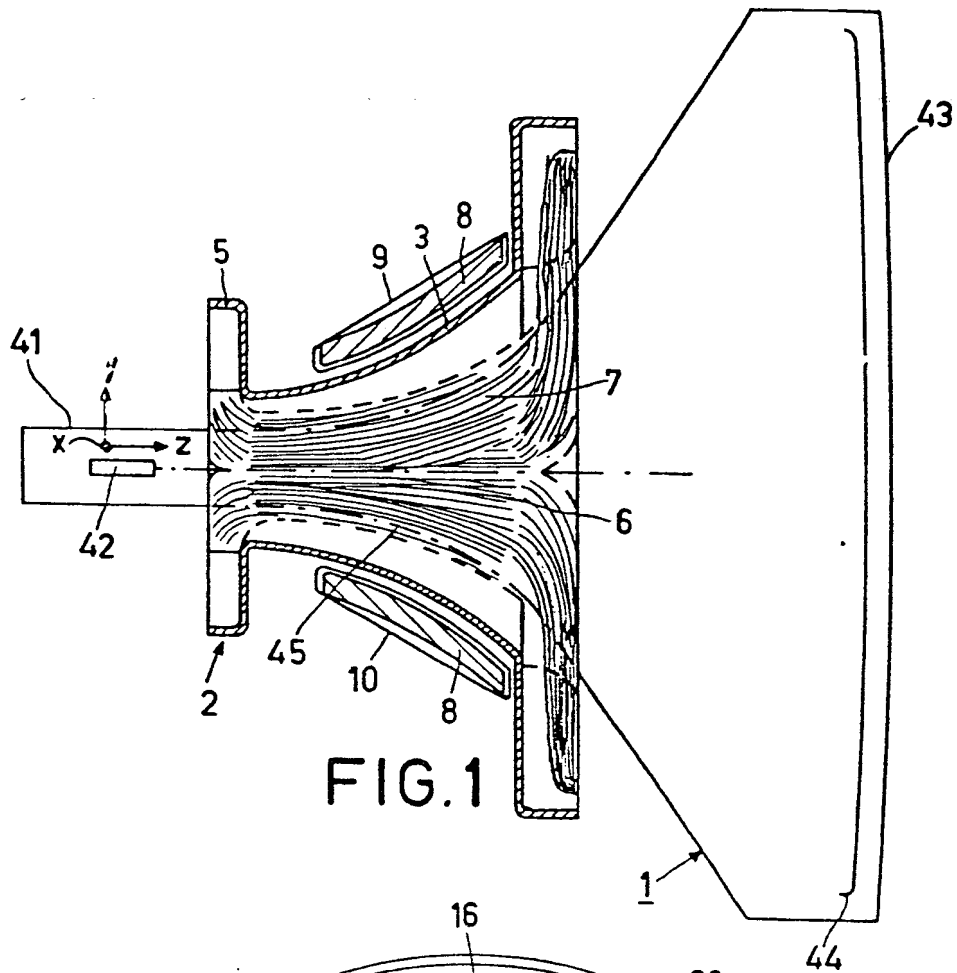
14. A deflection yoke as claimed in Claim 10, characterized in that the adjusting means comprises two
5 eccentrics which are rotatable about axes and which are respectively positioned in the spaces formed between the said adjoining longitudinal parts.

15. A deflection yoke as claimed in Claim 10, characterized in that the deflection means comprises four
10 cams movable in the front of the supporting member and each cooperating with an internal surface of one of the corners formed between a longitudinal part and a front transverse part in which, for increasing the distance between a first set of two oppositely located longitudinal
15 parts and simultaneously decreasing the distance between the other set of oppositely located longitudinal parts, the cams cooperating with the first set can be moved apart, and conversely.

16. A deflection device as claimed in Claim 19,
20 characterized in that the supporting member at least at one end is divided into two parts along the plane in which the non-deflected electron beams extend, a coil of the first set of coils being provided on each of said parts and that the adjusting means comprise two eccentrics with
25 which the two parts of the supporting member can be moved relative to each other.

17. A deflection device as claimed in Claim 10, characterized in that each axial part of the coils of the first set of coils is connected to another partially cut-
30 out part of the supporting member and that every two oppositely located cut-out parts are movable relative to each other by means of an eccentric journalled on the supporting member.

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2/3

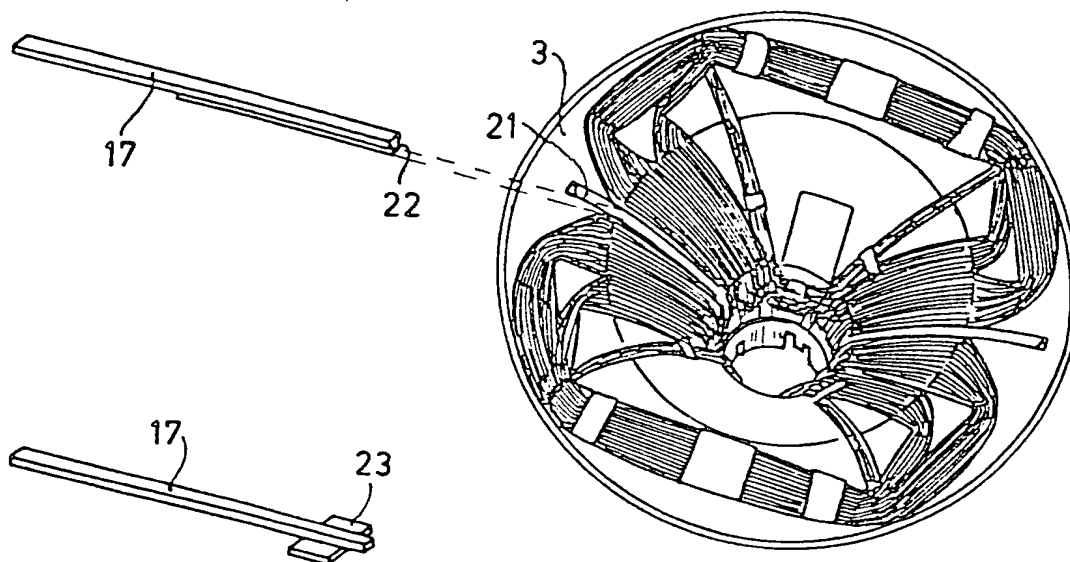


FIG. 4

FIG. 3

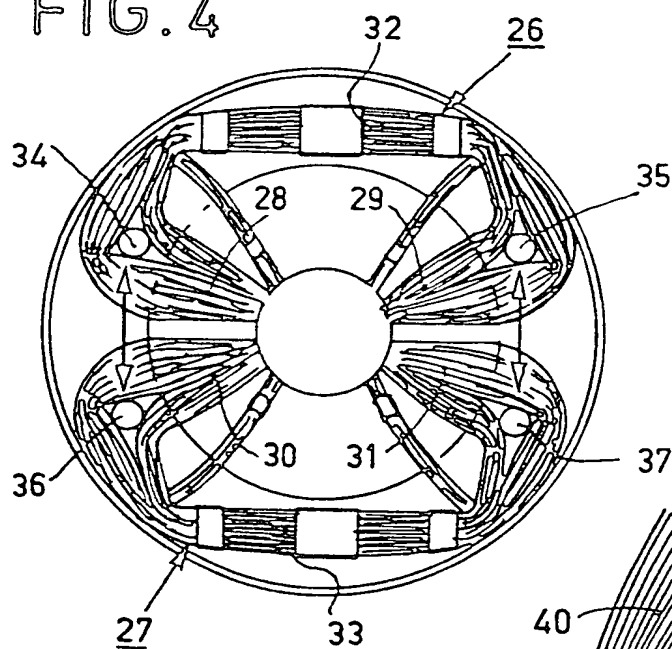


FIG. 5

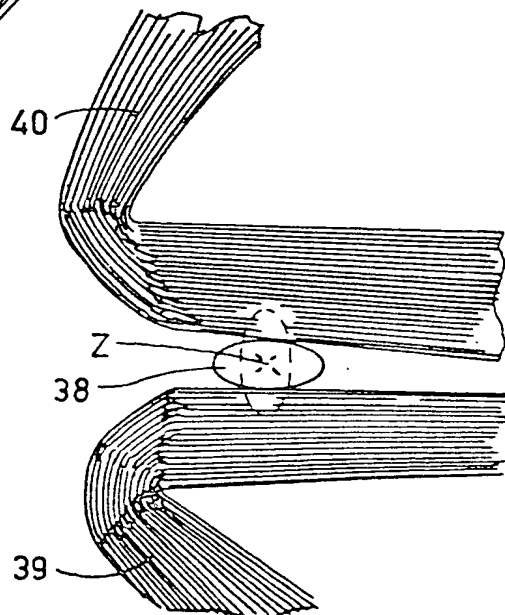


FIG. 6

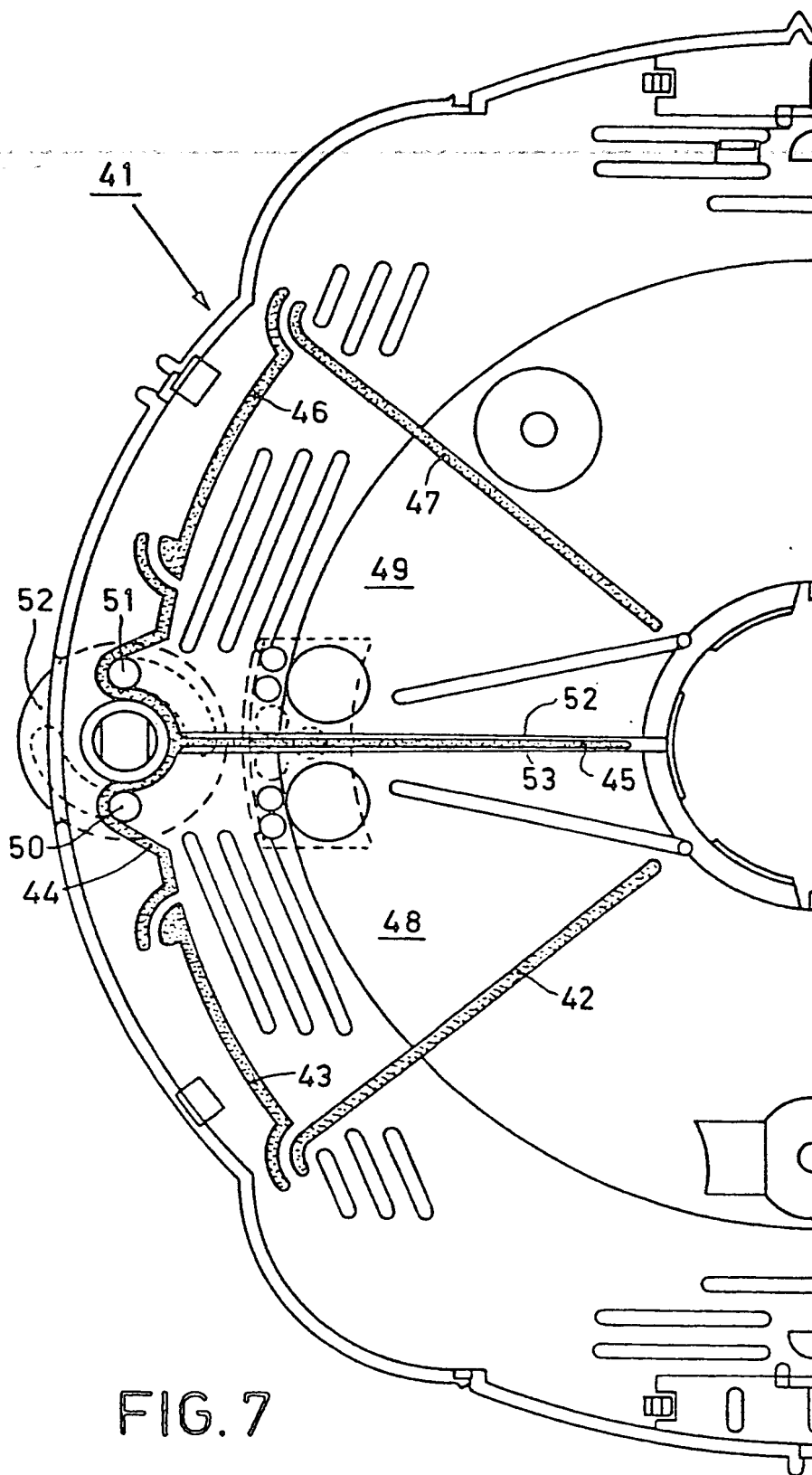


FIG. 7



European Patent
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EUROPEAN SEARCH REPORT

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Application number

EP 81 20 0761

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	<u>US - A - 3 287 605</u> (K.W. McGLASHAM) * Figure 6; column 5, lines 3-47 *	1, 5, 7, 10	H 01 J 29/76
DA	<u>NL - B - 148 441</u> (N.V. PHILIPS GLOEILAMPENFABRIEKEN) * Figures 2, 3; claim 1 * & US - A - 4 088 930	1, 10	
A	<u>US - A - 4 198 614</u> (RAGLAND JR) * Figures 1, 2; column 1, line 63 - column 2, line 6; claim 1 *	1, 10	
			TECHNICAL FIELDS SEARCHED (Int. Cl.)
			H 01 J 9/44 9/236 29/76 29/70 29/82 29/56 29/00 H 01 F 27/30
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family. corresponding document
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 26-10-1981	Examiner SCHAUB

